

REMARKS

The present invention relates to a battery separator.

In the Office Action dated December 20, 2004, it is appreciated that the Examiner recognized that the previous Amendment was sufficient to overcome the prior art rejections set forth in section 4 of the previous Office Action. However, in the Examiner's updated search of the prior art, ten additional U.S. Patent references were cited, and in particular, U.S. Patent 6,468,651 (Aikawa et al '651) was cited under 35 U.S.C. § 102(e) or alternatively under 35 U.S.C. § 103(a) as basis for rejection of claims 1, 5, 6, 11-15, 17-19, 23-30, 34-38. Furthermore, claims 7-9, 20-22, and 31-33 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the cited Aikawa et al '651 reference. Lastly, claims 1, 5-9, 12-15, 17-22, 24-33, and 35-38 were rejected under 35 U.S.C. § 103(a) based on EP 834 938 issued to Tanaka (EP '938).

In the present Amendment, independent claims 1, 17, and 28 have been amended, including the incorporation therein of subject matter from claims 11, 23, and 34, respectively; accordingly, claims 11, 23, and 34 - 44 have been canceled herein.

The amendments to the claims as described above are furthermore supported based on the disclosure in the specification, e.g., at page 6, lines 15-18, at page 7, lines 5-19, and at page 17, lines 21-29, of the present specification.

Applicants respectfully traverse the rejections, and respectfully submit that the amended claims herein are unanticipated and non-obvious *vis-à-vis* the newly cited art identified in the Office Action. The various rejections are discussed in further detail below.

Rejection under 35 U.S.C. § 103(a) based on EP 0 834 938

Claims 11, 23, and 34 including the above feature (iii) were not rejected under 35 U.S.C. § 103(a) based on EP 0 834 938. Therefore, independent claims 1, 17, and 28, rejected under 35 U.S.C. § 103(a) based on EP 0 834 938, have been amended herein to recite the feature set forth in non-rejected claims 11, 23, and 34, *viz.*, that the fibers forming the non-woven fabric are fixed substantially only by fusing the fibers to each other, and claims 11, 23, and 34 have accordingly been canceled.

Rejection under § 102(e) or § (102(e)/ §103(a) based on Aikawa et al '651

(1) Rejection under 35 U.S.C. § 102(e)/§ 103(a)

U.S. Patent 6,468,651 issued to Aikawa et al and the present application were at the time the invention was made, owned by, or subject to an obligation of assignment to, Japan Vilene Co., Ltd. Therefore, the Aikawa et al '651 reference may not be properly relied upon in support of the rejection under 35 U.S.C. § 102(e)/§103(e).

(2) Rejection under 35 U.S.C. § 102(e)

the most important features of the battery separator of the present invention resides in, but is not limited to, that the battery separator contains high-modulus fibers having a fiber length of 0.5 to 30 mm (i.e., staple fibers) and a Young's modulus of 50 cN/dtex or more, and is composed of specific material(s) (hereinafter simply referred to as "high-modulus fibers").

The Aikawa et al '651 reference does not disclose or suggest such a high-modulus fiber, and thus the battery separator of the present invention is different from the fiber sheet disclosed in the Aikawa et al '651 reference with respect to at least the use of the high-modulus fiber.

In addition, the battery separator of the present invention containing the high-modulus fibers shows advantageous effects as previously described in the Amendment filed September 23, 2003.

(2-2) Young's modulus of commonly used fibers

With respect to the high-modulus fibers used in the present invention, it was pointed out by the Examiner that the fiber sheet disclosed in the Aikawa et al '651 reference may contain, in addition to fine fibers, "conventional fibers" such as inorganic fibers, polyethylene, polypropylene, or polymethylpentene fibers, and that Applicants' high-modulus fibers include polymethylpentene, polyethylene or ethylene copolymers, and polypropylene or propylene copolymers (page 4, lines 4-8 of the Office Action).

However, it is well-known to those skilled in the art that a Young's modulus of commonly used fibers, such as polypropylene fibers or olefin composite fibers, is less than 50

cN/dtex. In this regard, Applicants have provided two Japanese documents, Attachments (A) and (B) herewith, and partial English translations thereof:

(A) The Textile Machinery Society of Japan et al, ed., "Sen-I Souran", published on May 26, 1970, page 11 (with cover pages)

(B) Japanese Unexamined Patent Publication (Kokai) No. 2002-180330, and an English abstract provided by Japanese Patent Office

For example, Attachment (A) shows that a Young's modulus of a polypropylene staple fiber is 160 to 450 kgf/mm² [= 17.2 to 48.4 cN/dtex ($\rho = 0.91 \text{ g/cm}^3$)]. In this connection, units of a Young's modulus "cN/dtex" and "kgf/mm²" can be converted by the following equations:

$$1 \text{ [cN/dtex]} = 10.2 \times \rho \text{ [kgf/mm}^2\text{]}$$

$$1 \text{ [kgf/mm}^2\text{]} = 0.098 / \rho \text{ [cN/dtex]}$$

$$[\rho: \text{Specific gravity of fiber (g/cm}^3\text{)}]$$

Further, Attachment (B) shows that a Young's modulus of an olefin composite fiber (particularly a sheath-core type composite fiber having a core component of polypropylene and a sheath component of polyethylene) is approximately 43.1cN/dtex.

In contrast, for example, a Young's modulus of a ultra-high-molecular-weight polyethylene fiber, which may be used in the present invention (see amended claims 1 and 17 herein) is approximately 1000 to 1600 cN/dtex (for example, as described in Table 1 of USP 6,605,348, not enclosed), and is extremely higher than that of a commonly used polyethylene staple fiber.

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No. 09/924,546

6,605,348, not enclosed), and is extremely higher than that of a commonly used polyethylene staple fiber.

As described above, a Young's modulus of commonly used fibers is generally less than 50 cN/dtex, and thus, the Aikawa et al '651 reference does not disclose or suggest the use of high-modulus fibers contained in the battery separator of the present invention.

Accordingly, it is respectfully submitted that remaining amended claims 1, 5-9, 12-15, 17-22, 24-33, and 35-44 are patentable over the cited art of record, and are now in condition for allowance. Early favorable action is earnestly solicited.

If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned attorney at the local Washington, D.C. telephone number listed below.

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No. 09/924,546

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

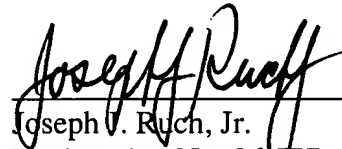
Respectfully submitted,

SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

WASHINGTON OFFICE

23373

CUSTOMER NUMBER



Joseph V. Ruch, Jr.
Registration No. 26,577

Date: April 20, 2005